© MAY 2026 | IRE Journals | Volume 9 Issue 11 | ISSN: 2456-8880
DOI: https://doi.org/10.64388/IREV9I11-1717933

Multi-Mode RFID Based Smart Attendance Management System

RITVIK RAHUT[1], JAYESH VERMA[2], PRATIBHA ADKAR[3]
[1, 2, 3]*MCA Department, P. E. S. Modern College of Engineering, Pune, India.*

Abstract- ***The traditional method of attendance marking at the institution and organizational level is not only inefficient but also takes a lot of time with potential for human errors and proxy attendances. In this paper, we have presented an innovative Multi-Mode RFID based Smart Attendance Management System that incorporates automation of the attendance marking process by integrating RFID technology with ESP32 and centralizing the process of database management. Each individual is provided with a unique RFID card and marked present after passing through the RFID reader. The key feature of this design is its capability to function in multiple modes, thereby enabling a single unit to operate in Schools, Colleges, and Office environments. Real-time feedback is provided with the help of an OLED display with a buzzer alert facility.***

Keywords—RFID, Attendance System, ESP32, IoT, Smart Attendance, Automation, Embedded Systems, Database Management.

I. INTRODUCTION

Management of attendance is an important aspect in both educational and organizational settings. Although traditional approaches like manual registers are popular, they have numerous disadvantages, such as wastage of time, human error, and proxy attendance. With the evolution of embedded systems and the Internet of Things (IoT), attendance tracking systems have become increasingly common. The use of Radio Frequency Identification (RFID) allows for the identification of persons without physical contact using distinct tags. This article explores a multi-mode RFID-based attendance tracking system that functions in various environments using only one piece of equipment.

II. LITERATURE SURVEY

Klaus Finkenzeller (2010)

The study by Klaus Finkenzeller examined the basics of RFID technology and its uses in identification and authentication. The research concentrated on the analysis of contactless communication processes applied to RFID smart cards and readers. In particular, the author noted that RFID technology allows automating many processes related to the management of big data and makes the process of information transfer more accurate and less dependent on human activity.

Arshdeep Bahga and Vijay Madisetti (2015)

The paper by Arshdeep Bahga and Vijay Madisetti addressed IoT-based architectures that combine embedded systems, cloud communication, and real-time synchronization technologies. In particular, the authors noted that IoT devices, which can be connected via WiFi networks, allow for efficient centralized monitoring of the processes and remote access.

Geraldine B. Mangmang (2018)

This paper proposed developing an automated management system with notification functions and centralized database architecture. The system provided real-time notifications, database synchronization, and monitoring opportunities. The author concluded that automation allows for increasing operational efficiency and minimizing delays associated with manually operated processes.

Joko Santosa and Adhitomo Wirawan (2019)

Joko Santosa and Adhitomo Wirawan developed a web-based management system that employed QR

code technology and centralized database architecture. The suggested system used PHP, HTML, and MySQL to manage real-time transactions and reporting processes. It was shown by the authors' research that web-based centralized management systems can enhance system reliability, facilitate data management and ensure scalability in institutional settings.

IEEE Research Publications (2021-2024)
Some research papers published via IEEE were concerned with RFID and NFC-powered attendance monitoring systems embedded with IoT technologies. The research papers suggested the usage of ESP32 microcontroller, cloud databases, web dashboards, and wireless communication modules for real-time attendance monitoring. It was argued by the researchers that IoT-based attendance monitoring systems minimize proxy attendances and synchronize data efficiently.

III. RESEARCH GAP

Though there are many kinds of automation systems available, there are several drawbacks associated with the currently available systems that need to be addressed for the development of an ideal attendance system.

Single Environment Problem
Currently available attendance systems are suitable for one particular environment, either educational institutions like school or college or business organizations like an office. These systems cannot be customized easily to work in another domain as they do not have flexibility. It is highly needed to develop a system which would be able to perform in various environments with the help of one machine.

Multi-Mode Problem
There is no such attendance system in existence at present that operates in multiple modes. All RFID based attendance systems are designed according to a pre-defined algorithm and therefore cannot work in multi-modes.

Insufficient Real-Time Processing and Feedback
Not all systems have the ability to give real-time feedback to their users after recording their attendance. Slow data processing or no real-time display affects the credibility of the system. There should be a system that can give visual and auditory feedback for better performance.

Lack of Adequate Integration with IoT and Cloud Computing
Most existing solutions have poor integration with IoT infrastructure and cloud computing technology. They fail to scale properly, lack remote monitoring capabilities, and have inefficient data synchronization across different platforms.

Non-availability of Central Monitoring Dashboard
Various attendance systems function independently, and there is no central dashboard for the purpose. Hence, it becomes difficult to monitor attendance logs, generate reports, and handle user management from one single platform.

Issues of Security and Proxy Attendance
Though the use of RFID enhances automation, various issues remain unresolved, such as that of proxy attendance. In simple terms, one user can sign the attendance for others as well.

Lack of User Interface
A large number of software packages are concerned with back-end functions and not with user interface design. As a result of the non-existence of interfaces that are easy to use, such as display screens, alert systems, and dashboards, scalability becomes problematic.

Problems with Scalability
Most applications are not scalable in the sense that they can be deployed on a large scale across many organizations or departments.

METHODOLOGY

IV. SYSTEM ARCHITECTURE

The system follows a layered architecture:

A. Hardware Layer
- ESP32 Microcontroller
- MFRC522 RFID Reader
- OLED Display

© MAY 2026 | IRE Journals | Volume 9 Issue 11 | ISSN: 2456-8880
DOI: https://doi.org/10.64388/IREV9I11-1717933

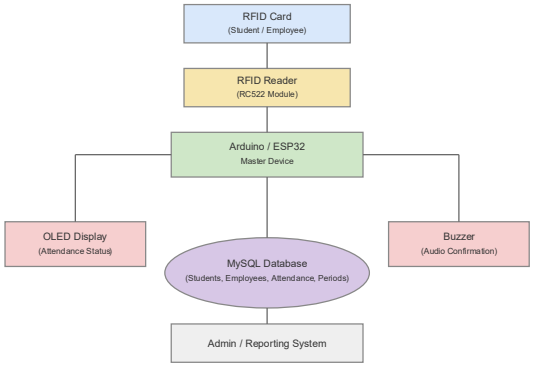
- Buzzer
- Push Buttons

B. Communication Layer
- WiFi Module (ESP32)
- API Communication

C. Database Layer
- MySQL Database
- Tables: Users, Attendance, Modes

D. Application Layer
- Web Dashboard
- Admin Panel

Flow of System:
RFID Card → Reader → ESP32 → WiFi → Server → Database → Dashboard



V. WORKING OF THE SYSTEM

A. Mode Selection
User chooses one of the following modes:
• School
• College
• Office

B. Card Scanning
Scanning of RFID card through the scanner.

C. UID Reading
ESP32 reads the UID of the card.

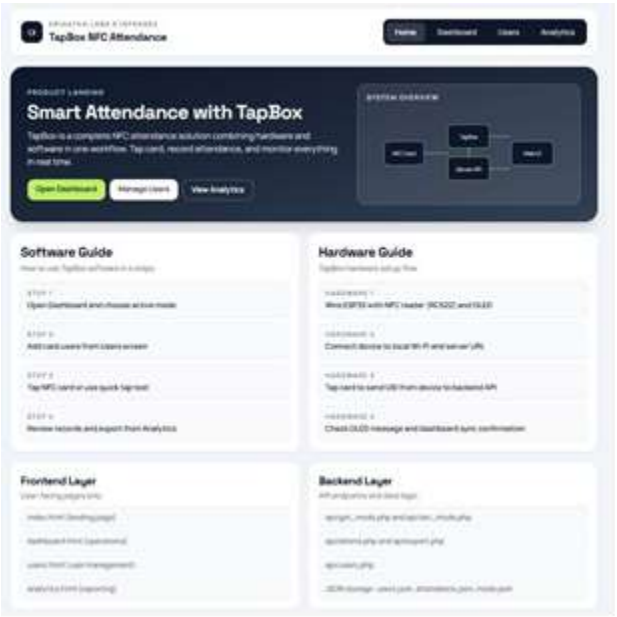
D. Data Transmission
UID and chosen mode are sent to the server.

E. Attendance Recording
UID and attendance are recorded by the server.

F. User Notification
• Confirmation message on OLED screen
• Buzzer alerts

VI. SYSTEM

SCREENS & OLED Display Interface
- Mode Selection Menu
- Attendance Confirmation Screen
- Web Dashboard (Admin Panel)



© MAY 2026 | IRE Journals | Volume 9 Issue 11 | ISSN: 2456-8880
DOI: https://doi.org/10.64388/IREV9I11-1717933

Also on the bottom section of our home tab we are providing the 2 extra guide features for our users that are Project

Here on the home tab we are providing the step by step guide for both hardware & software for the complete setup to run it.

Also we are providing the frontend & backend navigation guide to our users to navigate the features, The webpages of our software product.

Guide which basically contains the text format internal details of our product.

NFC Attendance System (TapBox)

Goal
Build a demo-ready NFC attendance system using:
- PHP + JSON backend
- ESP32 + NFC + OLED hardware
- Lightweight HTML frontend

Supports school, office, construction, and college attendance workflows in one system.

Small Architecture

Frontend (UI Pages)
- index.html (landing page)
- dashboard.html (mode control + quick tap + live snapshot)
- users.html (user management)
- analytics.html (filters + reports)

Backend (API Endpoints)
- api/get_mode.php
- api/set_mode.php
- api/attend.php
- api/export.php
- api/users.php

Core Services and Data
- get_mode.php, set_mode.php, attend.php, export.php
- users.json (registered users)
- attendance.json (attendance events)
- mode.json (active mode)

Request Flow
1. Frontend page sends request to /api/*
2. API endpoint executes backend PHP logic
3. Backend reads/writes JSON files
4. API returns response to frontend and/or ESP32

Attendance Logic

School Mode
- Always mark Present

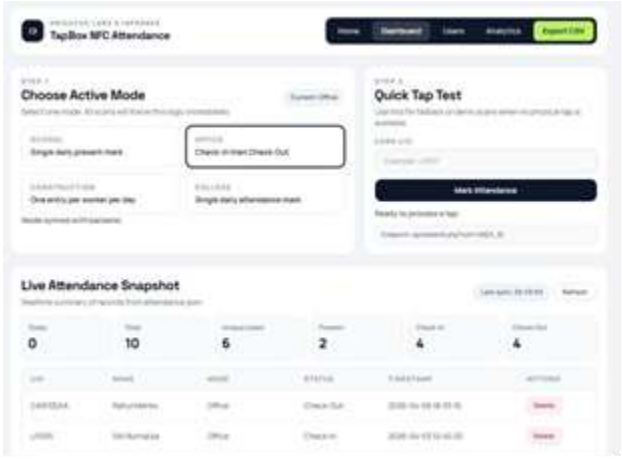
Office Mode
- First scan -> Check-In
- Second scan -> Check-Out

Construction Mode
- One entry per day

College Mode
- One entry per day

The next feature i.e. Hardware connection guide gives the textual format guide details of our hardware product the RFID attendance box.Wire configuration and all are listed/provided there.

Then we have the Start Using TapBox button which will redirect our users to the Dashboard tab.

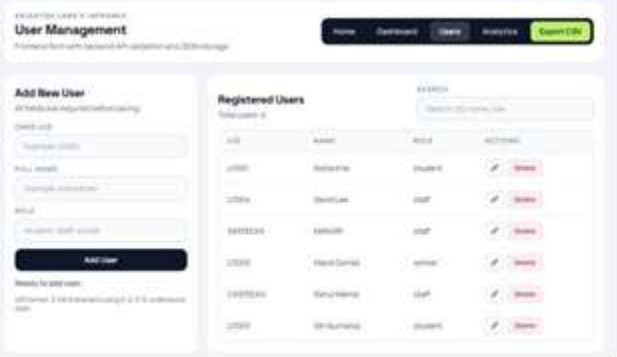


© MAY 2026 | IRE Journals | Volume 9 Issue 11 | ISSN: 2456-8880
DOI: https://doi.org/10.64388/IREV9I11-1717933

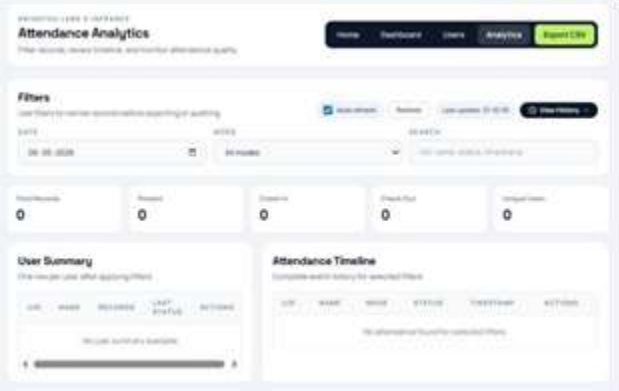
Here on the Dashboard tab, we are providing the Choose Active Mode in our Step 1 section to select the mode for our users to apply on real time environment.

Step 2 section contains Quick Tap Test section for our users to enter the uid of tohe nfc\rfid to quickly mark the attendance through our software and provided the Mark Attendance button for it.

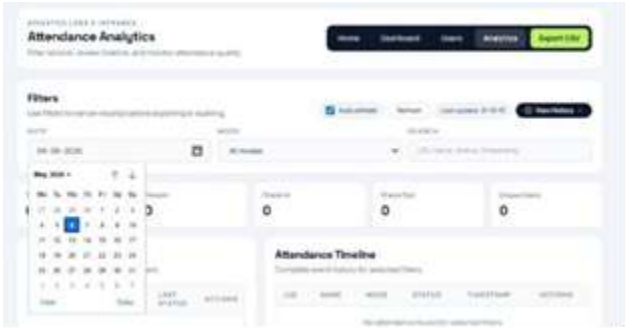
Also next to these 2 sections we are providing the Live Attendance Snapshot which displays the real time attendance with all the required details in the tabular form also we are providing the Delete action button for our user to delete the accidental marked attendance.



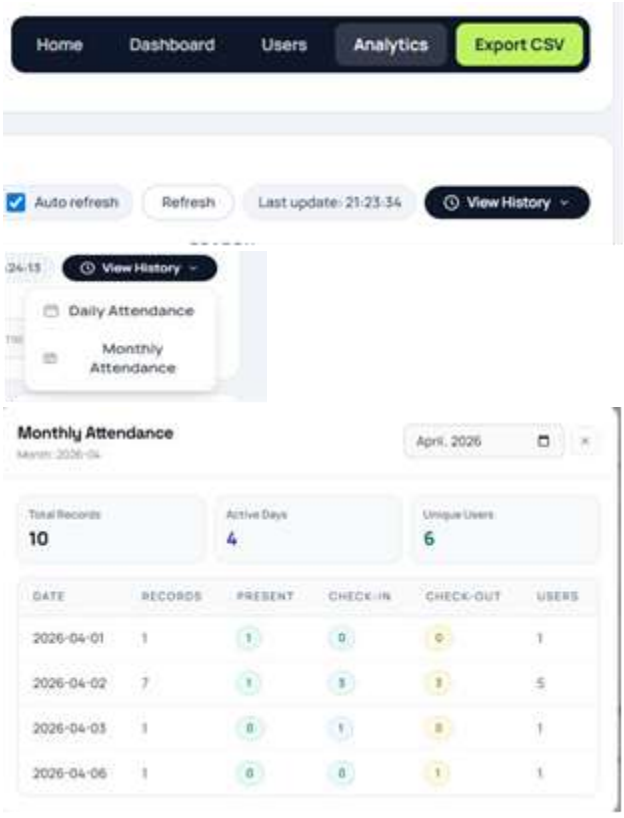
The next feature we are providing is our users tab where our clients can register the users and they can also perform the actions like edit and delete the users as per their convenience.



The next we have the Analytics tab where we have some awesome features like Filters to filter
out the narrow records of the attendance as per the 3 methods which we are providing for our users that are by selecting the date to list out (fetch) the number of attendance marked.

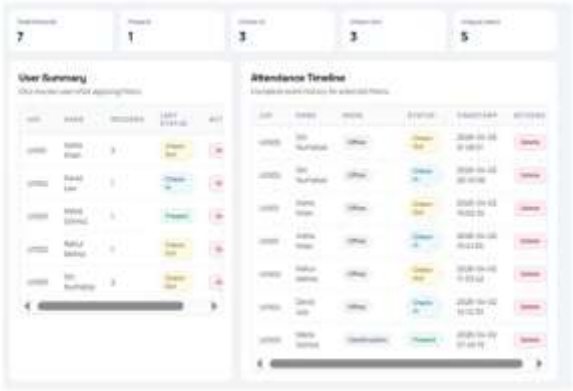


The next method which we have in our product is to view the Monthly attendance record for that we are providing the view history button as shown here.

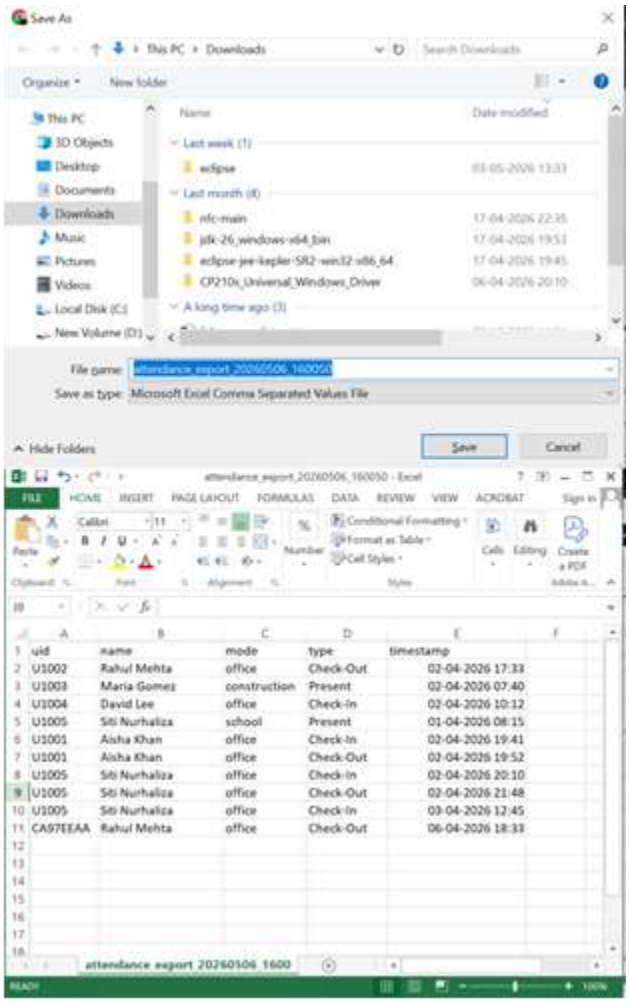


By applying these methods we can see the fetch data will be visible in the tabular form in the User Summary section and Attendance Timeline section as shown the image also we have the timestamp and delete action features.

© MAY 2026 | IRE Journals | Volume 9 Issue 11 | ISSN: 2456-8880
DOI: https://doi.org/10.64388/IREV9I11-1717933



The Next and the last we have Export CSV button to import the data in the csv format for storage.



uid	name	mode	type	timestamp
U1002	Rahul Mehta	office	Check-Out	02-04-2026 17:33
U1003	Maria Gomez	construction	Present	02-04-2026 07:40
U1004	David Lee	office	Check-In	02-04-2026 10:12
U1005	Siti Nurhaliza	school	Present	01-04-2026 08:15
U1001	Aisha Khan	office	Check-In	02-04-2026 19:41
U1001	Aisha Khan	office	Check-Out	02-04-2026 19:52
U1005	Siti Nurhaliza	office	Check-In	02-04-2026 20:10
U1005	Siti Nurhaliza	office	Check-Out	02-04-2026 21:48
U1005	Siti Nurhaliza	office	Check-In	03-04-2026 12:45
CA97EEAA	Rahul Mehta	office	Check-Out	06-04-2026 18:33

VII. APPLICATIONS

For students' attendance in schools
• For subject-wise attendance in colleges
• For employees' attendance in offices
• For training institutes
• For industrial workforce attendance

VIII. ADVANTAGES

Rapid and automatic system
• No proxy attendance
• Hands-free operation
• Instant results
• Centralized information storage
• Varied modes

IX. LIMITATIONS

Limited RFID range
Hardware dependency
Requires internet for database synchronization

X. CONCLUSION

Multi-mode RFID Attendance System as proposed in this article is quite an effective solution to handle modern attendance management issues. Using RFID technology in combination with ESP32, the project offers an efficient means to eliminate any possibility of manual errors and increases accuracy. Being multi-mode, the suggested solution is quite unique and can be implemented in different surroundings like school, college, office, etc.

REFERENCES

[1] T. S. Lim, S. C. Sim, and M. M. Mansor, "RFID Based Attendance System," in *IEEE Symposium on Industrial Electronics & Applications*, 2009.
[2] Kashif Ishaq and Samra Bibi, "IoT Based Smart Attendance System Using RFID: A Systematic Literature Review," *arXiv*, 2023.
[3] Aviraj Salunkhe et al., "A Review on Real-Time RFID-Based Smart Attendance Systems," *Advance Research in Analog and Digital Communications*, 2024.
[4] Carmelo Diego Lopez et al., "Scalable RFID-Based Automated Attendance Recording System," in *IEEE TENCON*, 2024.
[5] Christian Jay H. Valdez et al., "RFID-Based Student Monitoring System," in *IEEE Conference Proceedings*, 2024.

[6] Harsh Shinde et al., "GPS Based Attendance Management System with RFID Technology," *International Journal of Engineering Research & Technology (IJERT)*, 2017.

[7] Shubha Jain et al., "Automated Attendance Monitoring System Using Face Detection and RFID," *International Journal of Innovative Technology and Exploring Engineering (IJITEE)*, 2020.

[8] Princy Agarwal et al., "Attendance Monitoring System Using RFID and Face Detection," in *IEEE Conference Proceedings*, 2019.

[9] Sumita Nainan et al., "RFID Technology Based Attendance Management System," *arXiv*, 2013.

[10] Ezer Osei Yeboah-Boateng et al., "Automated Attendance System Using NFC."